



**US Army Corps
of Engineers®**
Portland District

OLD MOUTH OF THE COWLITZ RIVER FEDERAL PROJECT SEDIMENT QUALITY EVALUATION REPORT



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ACRONYMS

| | |
|-------|--|
| EPA | Environmental Protection Agency |
| USACE | U.S. Army Corps of Engineers |
| WDOE | Washington Department of Ecology |
| ODEQ | Oregon Department of Environmental Quality |
| WDNR | Washington Department of Natural Resources |
| DMEF | Dredge Material Evaluation Framework |
| NES | Newly Exposed Surface |
| QA/QC | Quality Assurance/Quality Control |
| TEL | Threshold Effects Level |
| TOC | Total Organic Carbon |
| PAH | Polynuclear Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| MDL | Method Detection Limit |
| PQL | Practical Quantitation Limit |
| MRL | Method Reporting Limit |
| TVS | Total Volatile Solids |
| TEF | Toxicity Equivalent Factor |
| TEQ | Toxicity Equivalent Quotient |
| ND | non-detect |
| pptr | parts per trillion – ng/kg |
| SL | Screening level |
| As | Arsenic |
| Cd | Cadmium |
| Ni | Nickel |
| Cu | Copper |
| Sb | Thallium |
| Cr | Chromium |
| Pb | Lead |
| Hg | Mercury |
| Ni | Nickel |
| Ag | Silver |
| Zn | Zinc |

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ABSTRACT

The Cowlitz River Old Mouth is located at RM 67.7 on the Columbia River mainstem on the north side of the river at Longview, WA (Figure 1). The Old Mouth site is no longer an active component of the Cowlitz River drainage and serves as a port access channel for log handling and rafting operations in the Port of Longview. The authorized channel is 150 feet wide and 8 feet deep and extends from deep water in the Columbia River to Old Mouth RM 0.7. The Cowlitz River active channel is separated from Old Mouth by a narrow peninsula, which ends in a rock groin in the main channel of the Columbia. The groin trains flows from the Cowlitz River, Carrols Channel on the Columbia and the Columbia mainstem away from the Cowlitz Old Mouth, but sediment tends to eddy around the end of the groin forming a shoal in the Old Mouth. Shoaling, due to a more or less continual influx of sediment from the Cowlitz, Carrols Channel, and the Columbia decreases channel depths here from the authorized 8-foot depth, to 4 or 5 feet.

This evaluation was conducted following procedures set forth in the Inland Testing Manual, developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to assess dredged material. Guidelines used are those developed to implement the Clean Water Act. These national guidelines and associated local screening levels are those adopted for use in the regional Dredge Material Evaluation Framework (DMEF), November 1998.

A total of three (3) gravity-core and one (1) boxcore sediment samples were collected along the length of the Old Mouth of the Cowlitz authorized channel, on September 10, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon and for both total (bulk) and pore-water tributyltin.

The physical analyses resulted in mean values of 0.16% gravel (0.00% to 0.78% range), 25.11% sand (2.62% to 58.81% range), and 74.70% silt/clay (42.93 % to 97.38% range), with 1.75% volatile solids (1.26% to 2.17% range). Mean grain-size for all the samples is 0.051mm; this material is classified as silt, silty sand and silt with sand.

The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF screening levels (SLs). No pesticides, PCBs, phenols, phthalates, miscellaneous extractables or tributyltin were detected in any of the samples. Several low and high molecular weight PAHs were detected, but at very low levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data.

Sediments represented by all samples in this sampling event are determined to be suitable for unconfined, in-water placement without further characterization.



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INTRODUCTION

The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP September 2003), and are, also, listed below. This report will characterize the sediment to be dredged and outline the procedures used to accomplish these objectives.

Sampling and Analysis Objectives

- To characterize sediments in accordance with the regional dredge material testing manual protocols, the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF), as well as, the Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or upland Confined Disposal Facilities – Testing manual (Upland Testing Manual).
- Collect, handle and analyze representative sediment, of the area to be characterized within Old Mouth Cowlitz River, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Analyze for full suite of Tier II a & b level, DMEF – Table 8.1, Physical, Metals, TOC, Pest/PCBs, Semi-volatiles and Organotin. Tier III, bioassays, are not planned for this sampling event unless further characterization is required.
- Gravity-core samples are planned for this sampling event. The primary sediment type for the Old Mouth of the Cowlitz River is silt, however, as you approach the mouth, near the Columbia River, it contains greater percentages of sand. The silty areas are well suited for gravity coring and no difficulty collecting cores is anticipated in these areas. Near the mouth, if area is sandy, the boxcore will be used.
- Characterize sediments, to be dredged, for evaluation of environmental impact of disposal options.

PREVIOUS STUDIES

Previous investigations carried out at this location show the sediments to be medium-grained sands in the Old Mouth channel, grading to medium-grained silts at the upper end of the channel at Old Mouth RM 0.7. Volatile solids ranged from 0.3 % by weight at the mouth to 2.2% at RM 0.7. Sediment in the main channel of the Columbia near Old Mouth is medium to coarse-grained sands, and volatile solids are usually less than 0.1% by weight. Sediment from the shoal at the Cowlitz Old Mouth has been found by previous studies to have a close resemblance to Columbia River sediment, which in this reach is dominated by relatively coarse-grained sand and silt-sized volcanic ash and rock flour from Mt. St Helens volcanic sediments.



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The sediment quality investigation conducted in 1991 showed only clean sediment at the Cowlitz River Old Mouth. The samples were subjected to Tier IIa physical analysis and Tier IIb chemical analysis. Tier IIb chemical analysis was not performed during the 1996 sediment quality investigation. Although the physical analysis performed revealed a substantial fraction of the sediment to be fine-grained, particle analysis and field-testing reveal negligible amounts of clay, plastic silt, or organic silt fractions in the samples. Sand was the predominant particle size, comprising over 60% of the samples.

CURRENT SAMPLING EVENT/DISCUSSION

A total of three (3) gravity-core and one (1) boxcore sediment samples were collected along the length of the Old Mouth of the Cowlitz authorized channel, on September 10, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon and for both total and pore-water tributyltin.

The physical analyses resulted in mean values of 0.16% gravel (0.00% to 0.78% range), 25.11% sand (2.62% to 58.81% range), and 74.70% silt/clay (42.93 % to 97.38% range), with 1.75% volatile solids (1.26% to 2.17% range). Mean grain-size for all the samples is 0.051mm; this material is classified as silt, silty sand and silt with sand.

The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF screening levels (SLs). No pesticides, PCBs, phenols, phthalates, miscellaneous extractables or tributyltin were detected in any of the samples. Several low and high molecular weight PAHs were detected, but at very low levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data.

Sediments represented by all samples in this sampling event are determined to be suitable for unconfined, in-water placement without further characterization.

The three (3) gravity-core sample recovery lengths were as follows: OMCR-GC-01=50", OMCR-GC-02=30", OMCR-GC-03=22", with one (1) boxcore, OMCR-BC-04=6".

Table 1. Sample Location Coordinates, (NAD 83, Oregon State Plane North)

| | | | |
|------------|----------------|------------|----------------|
| OMCR-GC-01 | 46° 06' 07.2" | OMCR-GC-02 | 46° 05' 57.7" |
| | 122° 54' 44.2" | | 122° 55' 16.1" |
| OMCR-GC-03 | 46° 05' 54.4" | OMCR-BC-04 | 46° 05' 49.3" |
| | 122° 55' 24.5" | | 122° 55' 41.5" |



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RESULTS

Physical and Volatile Solids (ASTM methods)

Three (3) gravity-core and one (1) boxcore sediment samples were submitted for testing, with data presented in Table 2. The physical analyses resulted in mean values of 0.16% gravel (0.00% to 0.78% range), 25.11% sand (2.62% to 58.81% range), and 74.70% silt/clay (42.93 % to 97.38% range), with 1.75% volatile solids (1.26% to 2.17% range). Mean grain-size for all the samples is 0.051mm; this material is classified as silt, silty sand and silt with sand.

Metals (EPA method 6020/7471), Total Organic Carbon (EPA method 9060)

Three (3) gravity-core and one (1) boxcore sediment samples were submitted for testing, with data presented in Table 3. The TOC ranged from 6090 to 11600 mg/kg in the samples.

Low levels of As, Cu, Pb, Hg, Ni and Zn were detected in all samples, but no levels approach their respective DMEF SL. MDLs were sufficiently below screening levels for good evaluation of material tested.

Pesticides/PCBs (EPA method 8081A/8082), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270)

Three (3) gravity-core and one (1) boxcore sediment samples were submitted for testing, with data presented in Table 4. No pesticides/ PCBs, phenols, phthalates or miscellaneous extractables were found at the MDL in any of the samples. MDLs were sufficiently below screening levels for good evaluation of material tested.

Polynuclear Aromatic Hydrocarbons (EPA method 8270C)

Three (3) gravity-core and one (1) boxcore sediment samples were submitted for testing, with data presented in Table 5. Two (2) "low molecular weight" PAHs were detected in 2 of the 4 samples at low detection levels. Eight (8) of the 9, "High molecular weight" PAHs analyzed, were present in 3 of the samples, but at levels well below screening levels. All values ranges were at or below 2.5% of their respective SLs. MDLs were sufficiently below screening levels for good evaluation of material tested.

Tributyltin [Total (Bulk) & Pore-Water]

Three (3) gravity-core and one (1) boxcore sediment samples were submitted for testing, with data presented in Table 6. No tributyltin was detected at low detection levels. MDLs were sufficiently below screening levels for good evaluation of material tested.



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CONCLUSION

Collection and evaluation of the sediment data was completed using guidelines from the DMEF. The DMEF is a regional manual developed jointly with regional EPA, Corps, Oregon Department of Environmental Quality and Washington Departments of Ecology and Natural Resources. This document is guidance for implementing the Clean Water Act (40 CFR 230), Section 404 (b)(1). The screening levels used are those adopted for use in the DMEF, final November 1998. The DMEF uses a tiered testing approach that requires material in excess of 20% fines and greater than 5% volatile solids, as well as any material with prior history or is suspected ("reason to believe") of being contaminated, be subjected to chemical as well as physical analyses.

A total of three (3) gravity-core and one (1) boxcore sediment samples were collected along the length of the Old Mouth of the Cowlitz authorized channel, on September 10, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon and for both total and pore-water tributyltin.

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REFERENCES

1. U.S. Army Corps of Engineers, Portland District and Seattle District; U.S. Environmental Protection Agency, Region 10; Oregon Department of Environmental Quality; Washington State Department of Natural Resources and Department of Ecology. 1998 Final. Dredge Material Evaluation Framework for the Lower Columbia River Management Area.
2. U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. February 1998. Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters - Testing Manual (referred to as the "Inland Testing Manual").
3. U.S. Army Corps of Engineers. January 2003. Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities - Testing Manual (referred to as the "Upland Testing Manual").
4. Clean Water Act, 40 CFR 230 (b)(1).
5. PSDDA. 1996. Puget Sound Dredged Disposal Analysis, Technical Information Memorandum, Testing, Reporting and Evaluation of Dioxin/furan Data in PSDDA Programs.
6. U.S. Army Corps of Engineers, Portland District; U.S. Environmental Protection Agency, Region 10. 1990. Results of Studies Correlating Total Organic Chlorine & Dioxin/furans in Selected Oregon Sediments.
7. U.S. Army Corps of Engineers, Portland District. 1991. Old Mouth of Cowlitz River Sediment Evaluation.
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Table 2. Physical Analysis & Volatile Solids

| Sample I.D. | Grain Size (mm) | | Percent | | | |
|----------------|-----------------|-------|---------|-------|-----------|-----------------|
| | Median | Mean | Gravel | Sand | Silt/Clay | Volatile Solids |
| OMCR-GC-01 | 0.009 | 0.034 | 0.00 | 2.62 | 97.38 | 2.01 |
| OMCR-GC-02 | 0.026 | 0.038 | 0.00 | 17.59 | 82.41 | 2.17 |
| OMCR-GC-03 | 0.033 | 0.076 | 0.78 | 22.29 | 76.93 | 1.55 |
| OMCR-BC-04 | 0.070 | 0.054 | 0.00 | 57.07 | 42.93 | 1.31 |
| OMCR-BC-04 DUP | 0.070 | 0.056 | 0.00 | 58.81 | 41.19 | 1.26 |
| Mean | 0.032 | 0.051 | 0.16 | 25.11 | 74.70 | 1.75 |
| Minimum | 0.009 | 0.034 | 0.00 | 2.62 | 42.93 | 1.26 |
| Maximum | 0.070 | 0.076 | 0.78 | 58.81 | 97.38 | 2.17 |



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Table 3. Inorganic Metals and TOC

| Sample I.D. | As | Sb | Cd | Cu | Pb | Hg | Ni | Ag | Zn | TOC |
|--|-------------|-------|--------|------|------|--------|------|--------|------|-------|
| | mg/kg (ppm) | | | | | | | | | |
| OMCR-GC-01 | 2.94 | <2.38 | <0.396 | 53.4 | 4.55 | 0.027 | 9.97 | <0.396 | 44.2 | 8600 |
| OMCR-GC-02 | 2.28 | <2.00 | <0.334 | 35.1 | 2.79 | 0.031 | 8.85 | <0.334 | 28.9 | 11600 |
| OMCR-GC-03 | 1.9 | <1.92 | <0.321 | 32.2 | 2.51 | 0.02 J | 8.55 | <0.321 | 29.3 | 8970 |
| OMCR-BC-04 | 1.41 | <1.95 | <0.326 | 18.5 | 1.76 | 0.026 | 6.23 | <0.326 | 21.2 | 6090 |
| Mean | 2.13 | ND | ND | 34.8 | 2.90 | 0.021 | 8.4 | ND | 30.9 | 8815 |
| Screening level (SL) | 57 | 150 | 5.1 | 390 | 450 | 0.41 | 140 | 6.1 | 410 | |
| <p>J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). Symbol (-) = no screening level established.</p> | | | | | | | | | | |



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Table 4. Pesticides, PCBs, Phenols, Phthalates & Tributyltin

| Sample I.D. | | | | | | |
|--|--------------|---------|------------|-----------|--------------|------------|
| | ug/kg (ppb) | | | | | ug/L (ppb) |
| | PCB Aroclors | Phenols | Phthalates | Total DDT | Tributyltin | |
| | | | | | Total (bulk) | Pore Water |
| OMCR-GC-01 | <16.6 | <16.3 | <16.3 | <1.1 | <2.55 | <0.009 |
| OMCR-GC-02 | <16.6 | <28.2 | <14.1 | <1.1 | <2.71 | <0.009 |
| OMCR-GC-03 | <16.6 | <28.2 | <14.1 | <1.1 | <2.71 | <0.009 |
| OMCR-BC-04 | <16.6 | <28.2 | <14.1 | <1.1 | <2.59 | <0.009 |
| Screen level (SL) | 130 | | | 6.9 | 73 | 0.15 |
| Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). | | | | | | |

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Table 5. Polynuclear Aromatic Hydrocarbons (PAHs), Low Molecular Weight Analytes

| Sample I.D. | Acenaphthene | Acenaphthylene | Anthracene | Fluorene | 2-Methyl naphthalene | Naphthalene | Phenanthr ene | Total Low PAHs |
|--|--------------|----------------|------------|----------|-------------------------|-------------|------------------|-------------------|
| | ug/kg (ppb) | | | | | | | |
| OMCR-GC-01 | <4.08 | <4.08 | 17.3 | <4.08 | <4.08 | <4.08 | 7.38 J | 24.68 |
| OMCR-GC-02 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | 7.04 J | 7.04 |
| OMCR-GC-03 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | 8.38 | 8.38 |
| OMCR-BC-04 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | <4.08 | ND |
| Mean | ND | ND | 4.3 | ND | ND | ND | 5.7 | 10.03 |
| Screen level (SL) | 500 | 560 | 960 | 540 | 670 | 2100 | 1500 | 5200 |
| Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit) J = Estimated value (reported values are above the MDL, but below the PQL). | | | | | | | | |

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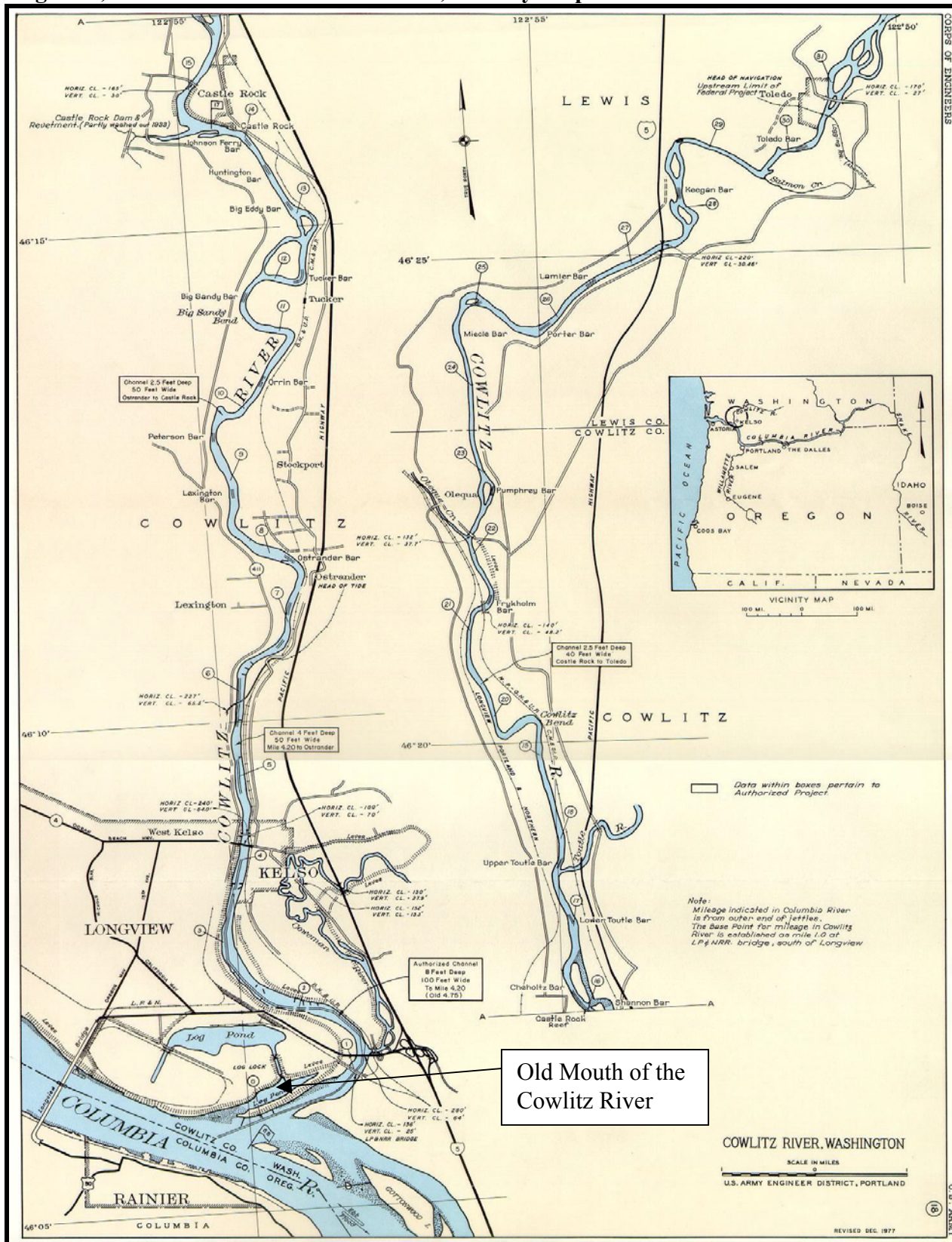
Table 5: Polynuclear Aromatic Hydrocarbons (PAHs) Low Molecular Weight

| Sample I.D. | Benzo(a)-anthracene | Benzo-fluoranthene | Benzo-(g,h,i)-perylene | Chrysene | Pyrene | Benzo(a)-pyrene | Indeno-(1,2,3-cd)-pyrene | Dibenz(a,h)anthracene | Fluoranthene | Total High PAHs |
|---|---------------------|--------------------|------------------------|----------|--------|-----------------|--------------------------|-----------------------|--------------|-----------------|
| | ug/kg (ppb) | | | | | | | | | |
| OMCR-GC-01 | 96.3 | 88.3 | 14.3 | 120 | <4.08 | 42.3 | 14.8 | <4.08 | 11.3 | 387 |
| OMCR-GC-02 | 5.11 J | 11 | <3.53 | 7.63 | 13.4 | <3.53 | <3.53 | <3.53 | 16.2 | 53 |
| OMCR-GC-03 | 9.08 | 10.2 | <3.52 | 10 | 21.6 | 3.88 J | <3.52 | <3.52 | 25 | 5.5 |
| OMCR-BC-04 | <3.51 | <3.51 | <3.51 | <3.51 | <3.51 | <3.51 | <3.51 | <3.51 | <3.51 | ND |
| Mean | 27.6 | 27.4 | 3.6 | 34.4 | 8.75 | 11.5 | 3.7 | ND | 13.1 | 111.4 |
| Screen level (SL) | 1300 | 3200 | 670 | 1400 | 2600 | 1600 | 600 | 230 | 1700 | 12000 |
| J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). | | | | | | | | | | |



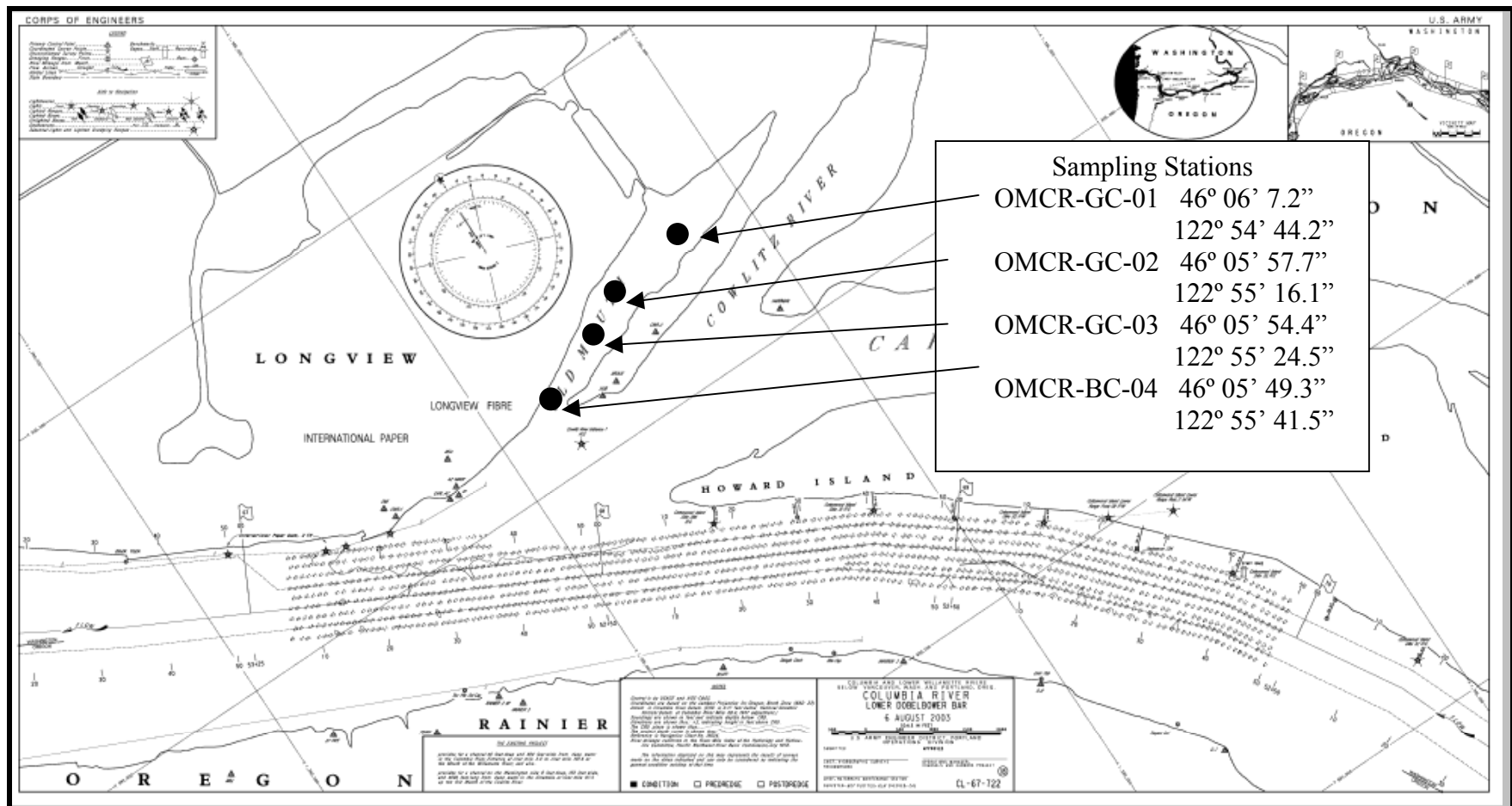
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Figure 1, Old Mouth of the Cowlitz River, Vicinity Map



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Figure 2, Old Mouth of the Cowlitz River, Sediment Sampling Station Locations



Old mouth of the Cowlitz River, Sediment Sampling Pictures

